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THE HISTORY OF CHEMISTRY.

A History of Chemistry from the Earliest Times to the Present Day. By Ernst von Meyer, Professor of Chemistry in the University of Leipzig. Translated by George McGowan. (London: Macmillan and Co., 1891.)

OF all branches of natural science, none has a history more profoundly interesting or more fascinating than chemistry. And yet, strange to say, none has received less adequate treatment from the historian. The reason for this comparative neglect is not far to seek. The historian of science must have qualifications which are rarely united in one man: not only must he possess the attributes of the successful writer on social, political, or economic history, but he must also be a past-master in the special branch with which he deals, and be well informed on all its cognate branches. Germany has given us the classical volumes of Kopp; from France comes the learned work of Hoefer; whilst in England we have had, until quite recently, to be content with the somewhat trivial, disjointed, and partial narration of Thomas Thomson. In addition we have had a number of monographs, especially within recent years, on the labours of particular individuals: many of these, like Henry's "Dalton," Wilson's "Life of Cavendish," Bence Jones's "Life and Letters of Faraday," and the remarkable series of biographical sketches which we owe to the facile pen of Hofmann, are delightful works; but these, after all, are only *mémoires pour servir*. As a rule, the more formal and general histories which deal with the organized growth of the science are not very attractive; either their authors lack literary grace and charm, or they are superficial, ill-informed, and, in some cases, so obviously biased as to render them altogether untrustworthy. And, moreover, not one of them has sought to grapple with the splendid achievements of the last half-century in any truly philosophic manner. Kopp and Hoefer have, between them, told us all that is known, or, in all probability, ever will be known, or need be known, respecting the beginnings of chemistry, and of its growth through the Middle Ages, and down to the end of the last century. We now require somebody to set about doing for this nineteenth century what the German and French historians have done for those that precede it. The labour would be stupendous, but the result might be magnificent. At no period in the history of the science have its generalizations been more brilliant, and its theories more comprehensive, more prolific, and, it may be added, more securely established. The birth of the century saw the extension of the atomic hypothesis to the explanation of the fundamental facts of chemical combination, and it has been the chief and most characteristic work of the century to place that theory on a foundation as sound and as firm as that on which the immortal conception of Newton is based. The historian of the chemistry of the nineteenth century need have no other text than that of the atomic theory; for round this dominant conception all other present-day theories are

ranged; it is the centre of a system which it vivifies and feeds, and by which it itself is fed and strengthened in return.

Some attempt at what is here foreshadowed has been made in the book before us, but, excellent as the work is in many respects, it is even more suggestive of what remains to be accomplished. The book is divided into six chapters, of which the fifth and sixth are devoted to the history of chemistry from the death of Lavoisier to the present time, and these two chapters occupy nearly three-fourths of the volume. This portion is not only the larger, but is confessedly the most difficult of the whole. In weighing and criticizing current chemical doctrine, and in discussing the theories of the present, even the most conscientious historian is apt to be unconsciously biased by the predilections and prejudices of his training and environment. Prof. von Meyer has not been unmindful of this possible danger, but after carefully reading his work we can heartily congratulate him on the success with which he has preserved the "objective attitude" which is essential to the true historian. As he tells us, it has been his earnest desire to shed a clear light upon the conflicting views respecting the development and importance of the chemical doctrines of to-day, and to endeavour to apply a calmer and juster criticism to the services of eminent investigators of quite recent years than has hitherto, in many cases, been meted out to them. It is possible that we apprehend Prof. von Meyer's meaning the more fully when we state that such a catholicity of sentiment and so judicial a temperament have not always characterized the occupant of the Chair of Chemistry in the University of Leipzig.

For the two chapters which treat of modern chemistry we have nothing but unqualified praise, and we earnestly commend them to the attention of those students who desire to have a *coup d'œil* at once comprehensive and accurate of the meaning and tendency of present-day doctrine. When we have regard to the enormous mass of material which has to be systematized, and, as it were, brought within focus, some errors and omissions are inevitable. And it is possible that here and there a slight lack of balance and due proportion may be discerned: some matters have been treated at comparatively great length, whilst others have been but scantily noticed. On this point differences of opinion are sure to arise: *tot homines, tot sententiae*. But no candid reader can fail to be impressed with the singularly fair and impartial manner with which Prof. von Meyer has dealt with the labours of contemporary workers. It is a pleasure to read a work in which the writer has been superior to the petty Chauvinism which has disfigured certain historical productions of the last twenty years. We would specially indicate the critical notices of the labours and services of Lavoisier, Berzelius, Davy, Dumas, Liebig, and Wöhler, as models of historical acumen, sound judgment, and rigid candour. On the time-honoured question, "With whom should rest the merit of the discovery of the composition of water?" Prof. von Meyer is scrupulously just and impartial. He shows that Lavoisier was so far dominated by his *principe oxygène ou acidifiant* that, in burning hydrogen, "he expected to find an acid as the product of its combustion, and therefore looked for one. It is the undisputed merit of the phlogistonist Cavendish to have

proved that water alone is produced by the combustion of hydrogen" (pp. 157-58).

Although he devotes only two chapters to it, it is obvious that it is the main purpose of Prof. von Meyer's work to trace the development of chemistry from the downfall of phlogistonism onwards, and he has therefore only dealt with the earlier periods in order to give the reader a connected view of the growth of the science. This portion of the work is touched with a comparatively light hand, and in some respects compares unfavourably with the rest. Although at times there are graphic sketches—as, for example, in the account of Palissy's work, and in the estimate of Bergmann's services to analytical chemistry, and in the story of that strange compound of truculent charlatanry, gross mysticism, and strong common-sense, who called himself Philippus Aureolus Paracelsus Theophrastus Bombastus—the general impression is not wholly satisfactory, and to trace the historical connection of the several epochs presupposes more knowledge than Prof. von Meyer imparts. It is hardly possible to do justice to the age of alchemy in 40 pages, or to the history of the iatro-chemical period, which includes the work not only of Paracelsus and his school, but also that of Van Helmont, George Agricola, Palissy, and Glauber, in 30 pages. But with the "Geschichte der Chemie" before him, Prof. von Meyer may well have hesitated to plough with the patient heifer of Hermann Kopp.

In his fourth chapter, where he deals with the period of the phlogiston theory, the author begins to expand somewhat, but occasionally, we venture to think, at the expense of strict historical accuracy. Thus it is not strictly true to say that Kunkel laboured "for years" to discover the secret of the preparation of phosphorus (p. 141), or that Cavendish defended the phlogistic theory "with all his might" (p. 118). That singularly austere and passionless person—that "cold clear Intelligence," as Wilson calls him—was utterly incapable of entering the lists as the champion of any theory. He let his Irish friend Kirwan, to whom it was more congenial, do all the fighting. It is hardly correct to describe the calm and philosophic Priestley as "eccentric and of a restless fiery nature." No man gave and got harder knocks in his time than did the kind-hearted, even-tempered old philosopher; he, too, did his fighting "all in the way of business," hitting straight and above belt, and with no malice in his blow; but to call him "eccentric," or "restless and fiery," reveals an entire misconception of his disposition and character. The occasion of Lavoisier's admission into the French Academy is only partially stated, and it is not wholly true to say that amongst all his numerous friends and admirers only one chemist, Loysel, had the courage to protest against his execution (p. 153).

A word in conclusion as to the manner in which Dr. McGowan has done the work of translation. His aim, he tells us, has been to reproduce clearly the sense of the German original, and in this he has, no doubt, succeeded admirably. But a purist might object that, in his efforts to preserve the sense, he has too carefully retained the idiom. To say that "the absorption of medicine in chemistry, the fusion of both together, was the watchword which emanated from Paracelsus" (p. 3) is scarcely

a happy method of expression. Nor is this paragraph much better:—

"Spirit of wine—the *aqua vitæ* of the alchemists—continued to grow in importance during the iatro-chemical age, as it had done in the alchemistic. This applied to it not merely from a theoretical point of view, as being a product of various fermentation processes to which much attention was paid, but also from a practical, since Paracelsus and his disciples used it largely in the preparation of essences and tinctures" (p. 95).

On p. 101, Boyle's manor in Dorsetshire is erroneously called "Stolbridge," and on p. 185 "Dalton" is incorrectly printed for "Davy." Such terms as "centre-point" and "fire-stuff" are not current English. Dr. McGowan's duty as a translator doubtless required him to say that "the nobility and poetry of his [Davy's] nature are shown both in the journals which he kept during his extensive travels in France, Germany, and Italy, and in his beautiful relations to Faraday" (p. 187); but the veracious historian, familiar with the annals of the Royal Institution, would probably have expressed himself differently.

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PROGRESS IN ELEMENTARY BIOLOGY.

Lessons in Elementary Biology. By T. Jeffery Parker, B.Sc., F.R.S., Professor of Biology in the University of Otago, New Zealand. (London: Macmillan and Co., 1891.)

PROF. JEFFERY PARKER is to be congratulated on having produced an extremely well-written, well-considered, and original class-book. The teaching of so-called "elementary biology" has, in consequence of the coercion of examination schedules and the multiplication of little cram-books dealing with the selected and protected "types," become in this country a very poor thing. The practical work in the laboratory with frog, fern, rabbit, and worm, which was, when first introduced, a step in advance, has become, like so many other things which were good in their origin, a tyranny and an impediment to knowledge. Students have resolutely shut their eyes to all facts but those presented by the schedule types, and teachers of a certain class have seen the easiest way to secure "examination results" in ignoring the generalizations of biology, and in plying their pupils with the regulation details as to the few animals and plants scheduled for dissection. Prof. Parker's book should help to remedy this state of things. His aim has been, he states, to supply the connected narrative which would be out of place in a practical hand-book. I agree with him that the main object of teaching biology as part of a liberal education is to familiarize the student not so much with the facts as with the ideas of science. In this little book the student will find many of the most important conceptions of biological science set forth and illustrated, not by reference merely to the types which he dissects or examines with greatest ease in the elementary course in a laboratory, but by the use of a larger area of well-chosen examples, both of plants and animals. Original woodcuts, often of exceptional merit, are freely introduced in the text.

Whilst the plan of Prof. Parker's book is excellent, I cannot help feeling some regret that he has not carried